

VIII.—On the Introduction and Dissemination of Noxious Insects.

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(Read May 26, 1882.)

During the early settlement of Canada, injurious insects were much less abundant than now, many of those most destructive having been imported from other countries, chiefly from Europe. In their native haunts efficient checks to undue increase have been provided in their insect enemies, chiefly parasitic species which prey upon and destroy them; but, unfortunately for America, these useful parasites did not accompany the destructive species in their migrations. Hence the latter, finding themselves placed amidst abundant food, increased amazingly and soon became a serious source of trouble.

Among those injuring our staple crops, we have the wheat midge (*Cecidomyia tritici*), introduced into this country about sixty years ago, and which since that time has spread over a most extensive area, bringing dismay and desolation wherever it has appeared in force. It is probable that this insect was first introduced either at Montreal or Quebec, in wheat brought from Great Britain, but it was first noticed as destructive in north-western Vermont in the year 1820. Within the next twenty-five years, it rapidly increased and excited much alarm among farmers in the Province of Quebec and in the Eastern and Middle States. In 1854 it was enormously abundant, and it was estimated that the midge destroyed that year, in the State of New York alone, fifteen millions of dollars worth of wheat. In 1856 the loss in Canada was believed to exceed two and a half millions of dollars, and in 1857 it destroyed about one-third of the entire Canadian wheat crop. For some years after it continued to be very destructive, but gradually lessened in numbers; and of late years this great staple product of the country has not been injured by this insect to any appreciable extent. Whether this immunity is due to climatic influences, to improved methods of cultivation and regular rotation of crops, to the introduction of superior varieties of wheat, more or less midge-proof, or to the friendly help of insect parasites, is unknown. Probably all these causes may have combined to bring about this beneficent result.

The Hessian fly (*Cecidomyia destructor*) is also generally believed to be an imported insect, brought here during the latter portion of the last century, although some distinguished entomologists believe it to be indigenous. This has also at times been a terror to the farmer, blasting his hopes and materially lessening the revenue which should have rewarded his honest toil.

The cabbage butterfly (*Pieris rapae*), which has proved such a pest to the market gardener, made its first appearance in this country, at Quebec, during the period of the American civil war, and is supposed to have been brought over with fresh vegetables, supplied to the British troops sent to Canada at the time of the Trent difficulty. The insect has since spread over an immense area and multiplied enormously. It now extends from the Gulf of St. Lawrence, all through the Eastern and Middle States, as far west as Nebraska and south to the Gulf of Mexico.

The codling moth (*Carpocapsa pomonella*), the great scourge of the apple-grower, was brought here about the beginning of the present century, and during the comparatively brief period which has since elapsed has spread over the greater portion of the North American continent. It is abundant and very destructive throughout the greater portion of our own country, exists throughout the Northern, Middle and Western States, and of late has found its way to the Pacific Slope, where it is committing great havoc among the apple and pear crops of that fine fruit region.

Among the other uninvited immigrants from Europe, in this department, the following are worthy of mention: the grain weevil, (*Sitophilus granarius*), the meal worm (*Tenebrio molitor*), the bark louse of the apple (*Aspidistius conchiformis*), the gooseberry sawfly (*Nematus ventricosus*), the currant borer (*Egeria tipuliformis*), and the asparagus beetle (*Crioceris asparagi*); and there are many others of less note. All these have now become widely disseminated and, in their several spheres of operation, impose upon our farmers, gardeners and fruit-growers a heavy yearly tax in time and money, in the efforts necessary to keep them in subjection.

If Canada has provided a port of entry for several of these pests which have since invaded our neighbours adjoining, we in turn have been supplied by them with the Colorado potato beetle (*Doryphora decemlineata*), which has migrated from its former quiet home in the cañons of the Rocky Mountains and, fired with the spirit of progress so characteristic of the United States, has availed itself of all the advantages of transport which an advanced civilization affords and thus spread rapidly over the greater portion of the continent.

The manner in which many of these pests have been introduced is not difficult to account for. The larvæ of the wheat midge lie dormant for months in the dry wheat heads, or amongst the grain when not properly cleaned, and during this inactive period may be carried with the grain many thousands of miles. The Hessian fly passes a long period of inactivity lodged in the wheat straw. The second brood of the codling worms remains in the winter apples as larvae, or about the apple barrels as chrysalids throughout the winter, and thus abundant opportunity is afforded for its distribution. These are given as examples, but many other similar instances might be cited.

With the onward march of civilization, the opening up of new portions of the country for settlement and the many means of rapid transit from one point to another, unlimited facilities are afforded for the dissemination of destructive insects. An insect on the Atlantic coast may take shelter in a railway car for a single night and the next day be found hundreds of miles in the interior. It was thus with the Colorado potato beetle and, within a short time after it invaded Ontario, it was found in Quebec and Nova Scotia. Many species are strong on the wing and able to fly long distances; in this way the cabbage butterfly has mainly spread itself.

Among the methods suggested for the subduing of injurious insects, there are none which offer so great a prospect of success as the encouragement and protection of those insects which feed on other insects, such as the lady-birds, ground beetles, tiger beetles, etc., and more especially by the introduction of those useful parasitic insects which in their native homes are always attendant on these destructive species and keep them within due bounds. In Europe, although the wheat midge is indigenous, it is rarely very destructive for the reason that there are three distinct species of minute parasitic flies which

attack and destroy it. We imported the midge but did not bring the parasites with it. In the case of the cabbage butterfly it is different; here the parasite has accompanied or followed the butterfly, and although it is not capable of spreading itself so rapidly over a given district, yet it industriously follows up and finds its victims wherever they may establish themselves and, within three or four years becomes so numerous that it keeps the troublesome butterfly under. For man to know how best to fight his insect foes, he must first acquire a knowledge of their life history, so as to acquaint himself with their most vulnerable points and thus be enabled to strike them when they are least capable of resistance.

All larvae which feed on the foliage of plants or trees may be destroyed by arsenical compounds, such as Paris green or London purple, both of which are best used mixed with water and applied with a sprinkler of some sort. Powdered hellebore, which is less poisonous, is also an efficient remedy for some species. Insect powders, which are the powdered flowers of one or more species of *Pyrethrum*, are also inimical to insect life, and, being non-poisonous to the higher forms of life, may be used to advantage with such an insect as the cabbage worm, where there is a difficulty in washing off a poisonous application from the leaves. Hot water may also be used in many instances where poisons are objectionable, since plants can usually endure without injury a temperature which produces great discomfort among insects and causes them to loose their hold on the leaves of the plants they are feeding on and drop to the ground. Insects in the caterpillar state are very subject to disease of a fungoid character which often sweeps them off by thousands. Many experiments have been made with the view of introducing such disease amongst them, and some measure of success has attended the efforts, but much further experimenting must be undertaken before practical methods can be devised. It is also well known that some odors are objectionable to insects, and that they will be repelled from plants pervaded with such odors. Many experiments are being tried in this direction just now, and it is hoped that some good practical results may shortly be arrived at.